FLOOD AND DROUGHT MITIGATION AND RESPONSE IN THE U. S.

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Introduction

Floods and droughts are natural disasters which often cause profound economic losses and social impacts when they occur. These hydrologic extremes are generally caused by abnormal temporal and spatial distribution of precipitations over a river basin. Historicallly severe floods and droughts have occurred both in China and in the United States. In the United States, recent severe floods occurred in the middle and upper reaches of the Mississippi River and lower Missouri River in 1993; on the Sacramento and American Rivers in 1986, 1995 and 1997; on Gila River in 1993; and Red River of the North in 1997. These floods caused billions of dollars of flood losses and affected thousands of people. In 1998, wide-spread flooding occurred throughout China. Severe flooding was reported on the Songhua, Yellow and Yangtze River basins.

During the late 1990's through early 1990's severe droughts occurred in the midwestern and southeastern states in the U. S. Because of the extended duration of the drought severe reservoir drawdowns were encountered in the drought affected regions. The waterborne commerce along the Mississippi River suffered heavy losses. Because of the low flow in the river, an emergengy submerged weir across the Mississippi River near New Orleans had to be constructed to arrest the saltwater intrusion. This prevented the river from impairing the water supply system for the City of New Orleans and its neighboring townships. In the southeastern United States, the drought caused heavy impacts on water supply, recreation, hydropower generation, and aquatic eco-system.

The characteristics of major river systems in China and the U. S. are similar in many aspects. Both countries have a long history of water resources development and operational experiences. This Workshop should provide a valuable forum for the participants from both countries to exchange flood and drought management experiences, share lessons learned, as well as explore opportunities for mutual cooperation.

Flood Damage Reduction

In the United States, the Federal government's role in flood control began in 1927 when, after devastating floods in the Mississippi River Valley, the U. S. Congress directed the Army Corps of Engineers to undertake flood control measures to protect life and property. In 1936

Congress further expanded the Corps of Engineers flood control mission to the entire nation. Through the years and up until today, the Corps of Engineers has built 383 major flood control dams and reservoirs, and emplaced 8,500 miles (13,600 Km) of levees, flood walls and channel improvements along major river systems in the U. S. These flood control projects have been operated by various Corps of Engineers division and district offices throughout the country with a tool called the Water Control Data System(WCDS). The WCDS consists of a group of software performing data collection, data processing, water control modeling, decision making and data dissemination. These projects have prevented about $387 billion (with adjustment for inflation $611 billion) in flood damages since 1928.

In the U. S. untill 1986 the Federal government was responsible for 100 % of flood control project costs with local sponsors contributed lands and easements for project construction. Under such funding arrangements, the level of protection for a project was generally established based on maximum economic output. With the passage of the Water Resources Development Act of 1986 by the U.S. Congress, the local sponsors must share up to 50 % of project costs including planning and engineering costs. The level of protection for a project under this Federal/local partnership is determined based on the acceptable balance of project costs and risk of flood damages.

It is recognized that the above mentioned structural measures for flood control, in fact, can not completely eliminate flood hazards, they can only reduce the flood damages. In addition, structural flood control measures tend to cause environmental impacts. As a result, non-structural measures have become viable flood control alternatives to be considered in planning flood reduction projects. While certain types of non-structural alternatives may be used in conjunction with structural alternatives they may also be used as independent measures for flood damage reduction projects.

The most common non-structural measures generally include flood proofing, flood warning and preparedness, flood insurance, temporary or permanent evacuation, and the regulation of land use in the flood plains. In the United States, the National Weather Service (NWS) issues flood warnings, the Federal Insurance Administration of the Federal Emergency Management Agency (FEMA) administers the flood insurance program, and state and local governments regulate the land use in the flood plains.

During flood emergency conditions all levels of governmental agencies and the general public work closely together. Through the years the United States Congress has passed various legislation authorizing several Federal agencies to carry out emergency measures during occurrence of natural disasters. For example, Congress provided the Corps of Engineers four authorities to carry out its disaster preparedness and response program. Among them Public Law 84-99 which is the most popular, provides the Corps of Engineers authority to planning and preparedness activities for all natural disasters including floods, hurricanes, earthquakes, droughts, vocanoes, etc. The legislation authorizes the Corps to provide technical assistance to state and local officials, floodfighting materials (e. g. sandbags, pumps), and emergency

contracting help to reinforce damaged levees and seepage berms. Public Law 84-99 also provided the Corps authority to perform post flood response, rehabilitation of damaged flood control works, emergency water and drought assistance, advance measures and hazard mitigation. During a flood emergency, FEMA provides emergency assistance and disaster relief.

Drought Mitigation

In the United States severe droughts occurred in the late 1980's and early 1990's. The regions affected by the wide-spread drought include the Pacific Northwest, California, Midwest and the Southeast. The drought had drastic impacts on domestic and industrial water supplies, navigation, agriculture and riverine ecosystems. Severe reservoir drawdown occurred almost everywhere including the six major reservoirs on the Missouri River. Water rationing as well as other drought response measures were put into place in the affected regions.

The droughts revealed weaknesses in the nation's water management systems during drought. In the aftermath of the drought, the Corps of Engineers initiated the National Drought Study for the purpose of developing an innovative, integrated, and collaborative approach to drought management. The study produced a series of reports and a Drought Preparedness Study (DPS) method. The DPS method was tested with four major case studies and has been applied to Corps projects for drought preparedness efforts.

As part of its mission, the United States Bureau of Reclamation has built and operates many water diversion projects in the western states in this country. These major diversion projects have provided lifelines and economic benefits for a large portion of population in the western United States.